APPENDIX J

CAPACITIES OF MAINS AND RISERS OF HOT WATER HEATING SYSTEMS

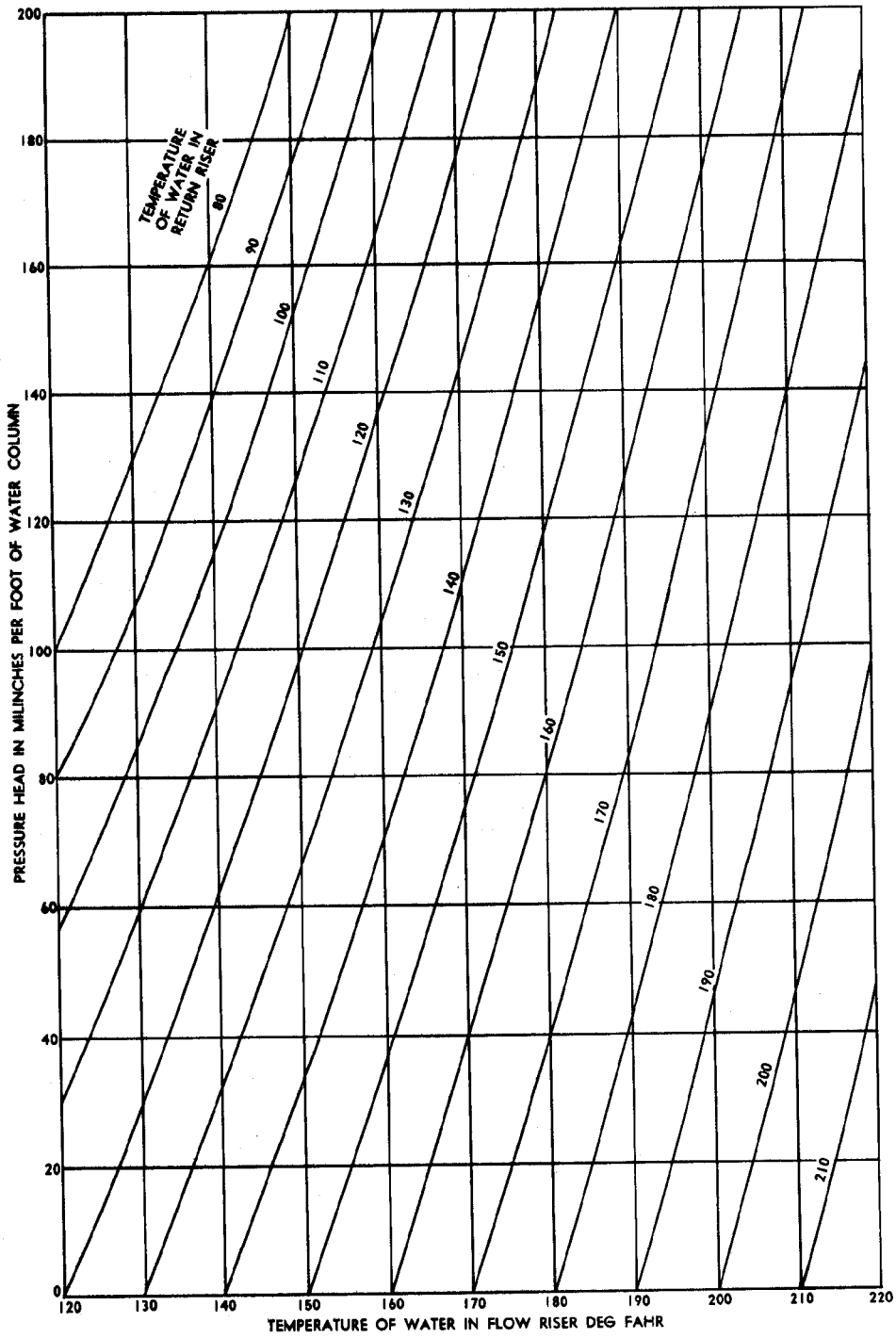

Figure J-1. Heads resulting from temperature difference in hot water systems.

Table J-1. Iron and Copper Elbow Equivalents [a]

Fitting	Iron pipe	Copper tubing
Elbow, 90°	1. 0	1. 0
Elbow, 45°	0. 7	0. 7
Elbow, 90° long turn	0. 5	0. 5
Elbow, welded, 90°	0. 5	0. 5
Reduced coupling	0. 4	0. 4
Open return band	1. 0	1. 0
Open gate valve	0. 5	0. 7
Open globe valve	12. 0	17. 0
Angle radiator valve	2. 0	3. 0
Radiator or convector	3. 0	4. 0
Boiler or heater	3. 0	4. 0
Tee, percent flowing through branch:		
100	1. 8	1. 2
50	4. 0	4. 0
25	16. 0	20. 0

[a] The friction in one 90° standard elbow is approximately equal to the friction of a length of straight pipe of the same nominal size and 25 diameters long. Hence, one elbow equivalent in feet of pipe equals 25 diameters (in inches) divided by 12.

Table J-2. Heat-Carrying Capacity of Standard Black Pipes with Temperature Floor Drop of 20° [a]

Milinch friction loss per foot of pipe		Nominal pipe size, inches															
		⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12
4	A	0.75	1.35	2.85	5.4	11.3	17.0	33.0	53.1	95	141	197	363	596	1,250	2,320	3,730
	B	1.5	1.7	2.1	2.4	2.9	3.2	3.8	4.3	5.0	5.5	6.0	7.0	7.9	9.6	11	12
6	A	0.9	1.7	3.6	6.75	14.0	21.2	41.3	66.4	119	176	248	456	748	1,570	2,920	4,690
	B	1.8	2.1	2.6	3.0	3.6	4.0	4.7	5.3	6.2	6.9	7.5	8.8	10	12	14	16
8	A	1.05	2.0	4.2	7.9	16.4	24.8	48.4	77.9	140	207	291	535	879	1,850	3,440	5,520
	B	2.1	2.5	3.0	3.5	4.2	4.7	5.6	6.3	7.3	8.0	8.8	10	12	14	17	19
10	A	1.2	2.2	4.7	8.9	18.6	28.0	54.7	88.1	158	234	329	605	997	2,100	3,910	6,270
	B	2.4	2.8	3.4	4.0	4.8	5.3	6.3	7.1	8.2	9.1	9.9	12	13	16	19	27
12	A	1.35	2.45	5.2	9.8	20.5	31.0	60.4	97.4	175	259	364	671	1,100	2,320	4,330	6,950
	B	2.7	3.1	3.7	4.4	5.3	5.9	6.9	7.8	9.1	10	11	13	15	18	21	24
14	A	1.45	2.65	5.65	10.7	22.3	33.7	65.8	106	190	282	397	731	1,200	2,530	4,730	7,590
	B	2.9	3.4	4.1	4.8	5.7	6.4	7.6	8.5	9.9	11	12	14	16	20	23	26
16	A	1.55	2.85	6.05	11.5	24.0	36.3	70.8	114	205	303	428	787	1,300	2,730	5,100	8,190
	B	3.1	3.6	4.4	5.1	6.2	6.9	8.1	9.7	11	12	13	15	17	21	25	28
20	A	1.75	3.25	6.85	13.0	27.1	41.0	80.0	129	232	344	484	892	1,470	3,100	5,790	9,300
	B	3.5	4.1	4.9	5.8	7.0	7.7	9.2	10	12	13	15	17	20	24	28	32
25	A	2.0	3.65	7.75	14.7	30.6	46.3	90.5	146	263	389	548	1,010	1,670	3,510	6,570	10,560
	B	4.0	4.6	5.6	6.5	7.9	8.8	10	12	14	15	17	19	22	27	32	36
30	A	2.2	4.0	8.55	16.2	33.8	51.2	100	162	290	430	607	1,120	1,850	3,900	7,280	11,710
	B	4.4	5.1	6.1	7.2	8.7	9.7	11	13	15	17	18	22	25	30	35	40
35	A	2.35	4.4	9.3	17.6	36.8	55.7	109	176	316	469	661	1,220	2,010	4,250	7,940	12,780
	B	4.7	5.5	6.7	7.9	9.5	11	13	14	16	18	20	23	27	33	39	44
40	A	2.55	4.7	10.0	18.9	39.6	59.9	117	189	341	505	712	1,320	2,170	4,580	8,570	13,780
	B	5.1	5.9	7.2	8.4	10	11	13	15	18	20	22	25	29	35	42	47
50	A	2.85	5.3	11.3	21.4	44.7	67.7	133	214	386	572	807	1,490	2,460	5,190	9,720	15,650
	B	5.7	6.7	8.1	9.5	12	13	15	17	20	22	24	29	33	40	47	54
60	A	3.15	5.85	12.4	23.6	49.4	74.9	147	238	427	633	893	1,650	2,730	5,760	10,780	17,360
	B	6.3	7.4	8.9	11	13	14	17	19	22	25	27	32	36	44	52	60
70	A	3.45	6.35	13.5	25.7	53.8	81.4	160	258	465	690	973	1,800	2,970	6,280	11,760	18,950
	B	6.9	8.0	9.7	11	14	15	18	21	24	27	29	35	40	48	57	65

See footnotes at end of table.

AGO 20073A

Table J-2. Heat-Carrying Capacity of Standard Black Pipes with Temperature Drop of 20 °—Continued

Milinch friction loss per foot of pipe		Nominal pipe size, inches															
		⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12
80	A	3.7	6.8	14.5	27.6	57.9	87.6	172	278	500	743	1,050	1,940	3,200	6,770	12,690	20,440
	B	7.4	8.6	10	12	15	17	20	22	26	29	32	37	43	52	62	70
100	A	4.15	7.7	16.4	31.1	65.4	99.0	194	314	566	840	1,190	2,200	3,630	7,680	14,400	23,200
	B	8.3	9.7	12	14	17	19	22	25	30	33	36	42	48	59	70	80
150	A	5.2	9.6	20.4	38.8	81.6	124	243	393	709	1,050	1,490	2,760	4,560	9,650	18,120	29,220
	B	10	12	15	17	21	23	28	32	37	41	45	53	61	74	88	101
200	A	6.05	11.2	23.9	45.4	95.5	145	285	461	832	1,240	1,750	3,240	5,360	11,350	21,320	34,400
	B	12	14	17	20	25	27	33	37	43	48	53	62	71	87	104	118
300	A	7.5	13.9	29.7	56.6	119	181	356	577	1,040	1,550	2,190	4,060	6,730	14,270	26,830	43,300
	B	15	18	21	25	31	34	41	46	54	60	66	78	90	110	131	149
400	A	8.75	16.2	34.7	66.2	140	212	417	676	1,220	1,820	2,570	4,780	7,910	16,790	31,580	51,000
	B	18	21	26	30	36	40	48	54	64	71	78	92	105	129	154	175
500	A	9.85	18.3	39.2	74.8	158	239	471	765	1,380	2,060	2,910	5,410	8,970	19,040	35,840	57,880
	B	20	23	29	33	41	45	54	62	72	80	88	104	119	147	174	199
600	A	10.9	20.2	43.2	82.5	174	264	521	846	1,530	2,280	3,220	5,990	9,930	21,100	39,740	64,210
	B	22	26	32	37	45	50	60	68	80	89	97	115	132	162	193	221
800	A	12.7	23.6	50.5	96.5	204	310	610	992	1,790	2,670	3,780	7,030	11,670	24,820	46,780	75,620
	B	25	30	37	43	52	59	70	80	94	104	114	135	155	191	228	260

* Nominal pipe sizes ⅜ to 12 inches, and friction 4 to 800 milinches per foot (A = capacity, Mbh. B = Velocity, inches per second). (One milinch equals (0.001 in.).

For other temperature drops the pipe capacities may be changed correspondingly. For example, with a temperature drop of 30°, the capacities shown in this table are to be multiplied by 1.5.

Table J-3. Heat-Carrying Capacity of Type L Copper Tubing with Temperature Drop of 20 °

Nominal tube size, in.		Milinch friction loss per foot of tube											
		720	600	480	360	300	240	180	150	120	90	75	60
⅜	A	10	9	8	6.8	6.2	5.4	4.6	4	3.6	3	2.8	2.4
	B	27	24	21	18	16.5	14	13	11	10	8.5	8	7
½	A	20	18	16	13.5	12	10.8	9	8	7	6	5.4	4.7
	B	35	30	25	21	19	17	15	13	12	10	9	8
⅝	A	36	30	26	22.1	20	17.8	15	13.1	11.8	9.9	9	7.9
	B	37	34	30	24	21	19	17	15	13	11	10	9
¾	A	51	46	40	34	31	28	23.2	20.5	18.1	15.3	13.9	12.[illegible]
	B	42	38	33	27	24	21	19	17	14	12	11.5	10
1	A	104	94	82	70	63	56	47	42	37	32	28	25
	B	48	45	39	34	30	25	22	19	17	14.5	13	12
1¼	A	185	169	149	125	112	100	84	75	66	56	50	44
	B	55	51	45	39	35	30	25	22	19	17	16	13
1½	A	300	270	235	200	180	160	134	120	105	90	81	71
	B	62	57	51	43	39	35	30	25	22	19	17	15
2	A	625	560	495	420	375	335	280	250	200	188	170	150
	B	76	68	59	51	47	42	36	32	27	22	20	18
2½	A	1,130	1,010	890	750	680	600	500	450	395	335	305	270
	B	90	80	69	58	49	47	42	37	33	26	23	21
3	A	1,840	1,650	1,450	1,210	1,100	980	820	740	650	550	490	420
	B	98	90	80	66	59	52	47	42	36	30	27	23
3½	A	2,750	2,480	2,170	1,840	1,650	1,450	1,210	1,100	980	820	740	540
	B	110	100	89	75	66	57	51	45	40	35	30	26
4	A	3,900	3,505	3,100	2,600	2,350	2,090	1,760	1,580	1,390	1,180	1,080	950
	B	120	108	96	83	73	63	55	49	44	37	34	29

* For other temperature drops the pipe capacities may be changed correspondingly. For example, with temperature drop of 30 degrees the capacities shown in this table are to be multiplied by 1.5. Nominal tube sizes ⅜ to 4 inches, and friction 60 to 720 milinches per foot. (A=capacity, Mbh. B=velocity, inches per second) (One milinch equals 0.001 inch).